

**Table 1.**

**FOR**

**TITLE:        DEVELOPING MOBILE UNIT BASED ESTIMATES  
                 OF METERED PACKET CHARGES**

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DEVELOPING MOBILE UNIT BASED ESTIMATES  
OF METERED PACKET CHARGES

Background

This invention relates generally to wireless  
5 telecommunication systems and particularly to such systems  
that provide a variety of different services.

Third generation wireless systems are packet based  
multi-service networks supporting a range of communication  
requirements for different applications. To support the  
10 multi-service features, third generation networks may  
guarantee a certain quality of service to each session  
established by a mobile subscriber. A mobile subscriber  
may establish up to sixteen sessions through a given packet  
data protocol address. A packet data protocol is any  
15 protocol that transmits data as discrete units known as  
packets. A packet is an information unit identified by a  
label.

Advice of Charge is a supplementary service that  
provides third generation mobile subscribers with  
20 information to produce an estimate of the cost of service  
used. See "Advice of Charge Supplementary Service Stage  
One," 3G TS 22.086 v3.1.0 (1999-10) available from the  
Third Generation Partnership Project, 650 Route des  
Lucioles-Sophia Antipolis, Valbonne-France; Description of  
25 Charge Advice Information 3G TS 22.024 v3.00.1 (1999-10)

available from the Third Generation Partnership Project. Charges are indicated for a call in progress when mobile originated or for the roaming leg only when mobile terminated.

- 5           Packet based services provided by third generation networks may include streaming audio, streaming video, multimedia and data. For these kinds of services, there may be more downlink traffic than uplink traffic. The current specification for the Advice of Charge
- 10 supplementary service does not provide complete charge information for the mobile terminated calls.

- The service specified in the Advice of Charge supplementary service specification is service provider based. Therefore, if the service provider chooses not to
- 15 support the service, a particular mobile subscriber will not be provided with the information. In addition, the Advice of Charge supplementary service does not take into account the possibility that a particular packet data protocol address may have a plurality of sessions
- 20 associated with that address. Each of those sessions may be receiving a different type of data having a different quality of service specification. Thus, the estimate received through the Advice of Charge supplementary service may be inaccurate.

- 25           Thus, there is a need for a system that better advises mobile subscribers of the charges they are incurring.

### Brief Description of the Drawings

Figure 1 is a schematic depiction of a system in accordance with one embodiment of the present invention;

Figure 2 is a flow chart for software in accordance  
5 with one embodiment of the present invention;

Figure 3 is a schematic depiction of a mobile unit in accordance with one embodiment of the present invention.

### Detailed Description

Referring to Figure 1, a mobile unit 10 may be a  
10 cellular telephone. In one embodiment, the unit 10 is a subscriber unit in a third generation or higher mobile phone communication system.

The mobile subscriber has a packet data protocol  
address 12. This is the address through which the mobile  
15 subscriber is identified in the cellular network. However, in some embodiments, each mobile subscriber may have a plurality of sessions or contexts ongoing at any time. For example, sixteen sessions may be ongoing at any given time. Each of these sessions may use a different type of packet-  
20 based service.

Thus, in Figure 1, the packet data protocol context  
14a is a voice session, the context 14b is a data session,  
and the context 14c is a streaming session. Any of a  
variety of packet-based services may be established in a  
25 given session at a given packet data protocol address 12.  
Thus, a plurality of data sessions may be ongoing at any

given time or a mixture of streaming audio, streaming video, multimedia and data services may be ongoing at any given time at a given address 12.

Each of the sessions 14 may have a specified set of  
5 quality of service parameters called a traffic flow  
template 16. See "General Packet Radio Service (GPRS);  
Service Description; Stage 2" 3G TS 22.060 v.3.2.1 (2000-  
01) available from The Third Generation Partnership  
Project. Each traffic flow template 16 provides certain  
10 quality of service parameters that may be specified for a  
given session. One session may have unspecified parameters  
and, in such case, a default may be automatically utilized  
in some embodiments.

Each of the sessions 14 may communicate with an  
15 account manager 18. The account manager 18, in one  
embodiment, may be a software module that is responsible  
for receiving information from the sessions 14 and  
determining the real time charges that have been incurred.  
To assist in this function, the account manager 18 may  
20 receive information from the mobility management state of  
the mobile unit as indicated at 22 and charge advice  
information pursuant to various specifications including  
the Advice of Charge supplementary service, as indicated at  
block 20. Of course, in some cases, the charge advice  
25 information 20 may be available and in other cases, a

network or service provider may opt not to provide that information.

Software 24, shown in Figure 2, may estimate the charge for each of the sessions 14. This estimate may be based on a wide variety of measures including the number of packet data units that are being transmitted across the network. In one embodiment, the packet data units may correspond to home units that are the basic telecommunication unit as published by the mobile subscriber's home public land mobile network (home PLMN) and may be in the currency of the mobile subscriber's home country. Additional information that may be utilized to assess the charges may include the number of packet data units that are received by the mobile subscriber. Also relevant may be the quality of service parameter information for each session based on the traffic flow template 16 for that session. The charge advice information message received from the network at the beginning of the call may also be useful. This message may be pursuant to the Third Generation Partnership Project technical specification 3G TS 22.024 in one embodiment.

The mobility management state information for charge estimation for all call legs including roaming and non-roaming calls may be used. Mobility management is a relation between the mobile station and the Universal Terrestrial Radio Access Network that is used to set up,

maintain and release the various physical channels. See  
"General Packet Radio Service (GPRS); Service Description;  
Stage 2" 3G TS 22.060 v.3.2.1 (2000-01) available from the  
Third Generation Partnership Project. Thus routing area  
5 (RA) updates may be acquired upon call origination and  
termination. The identified routing area may be used to  
determine charges including roaming charges, for example  
using a look up table. These charges may be determined for  
both mobile originated and mobile terminated calls.

10 The Universal Terrestrial Radio Access Network  
identifies that part of a network that consists of radio  
network controllers and node b's. A node b is a logical  
node responsible for radio transmission or reception in one  
or more cells to or from user equipment. A radio network  
15 controller is equipment in charge of controlling the use  
and integrity of radio resources.

Thus a report may be developed of charges based on  
protocol data unit transmissions, providing the packet-  
based mobile subscriber with the capability to manage his  
20 or her account and keep track of charges incurred. In some  
embodiments, the charges may be specified in terms of home  
units and in other embodiments, the charges may be  
specified in the currency of the home user's country, as  
two examples.

25 Initially, the software 24 determines whether a new  
packet data protocol context or session has been activated

as determined at diamond 26. If so, the quality of service (QoS) parameters for that session are sent to the account manager 18 as indicated in block 28.

5 If a new context or session is not activated, a check at diamond 30 determines whether a context or session has been modified. If so, the updated quality of service parameters are provided to the account manager 18 as indicated in block 32.

10 A check at diamond 34 indicates whether any new packet data units have been received or delivered. If so, the cost is updated to the account manager 18 as indicated at block 36. The account manager 18 may also receive charge advice information messages from the network as indicated at 38 in some situations. In addition, the account manager 15 may receive the mobility management state of the mobile subscriber as indicated at 40. The flow then recycles back to diamond 30.

20 Referring to Figure 3, a mobile unit 50 may include a network interface 42 coupled to a processor 44. The processor 44 may have an associated storage 46. The storage 46 may store the charge per session software 24 in one embodiment.

25 Embodiments of the present invention may provide charge information to mobile terminals irrespective of the applicable air interface. Moreover, in some embodiments, a real time estimate of the charges per session may be



provided, irrespective of whether or not the applicable service provider supports Advice of Charge supplementary services. In addition, in some embodiments, the account manager 18 provides a real time estimate of cost per

5 session for all legs, roaming and non-roaming. Moreover, in some embodiments, the quality of service parameters may be utilized to supplement the estimate of costs of service per session. Thus, each of a variety of sessions may have a different service, which may incur costs at a different  
10 rate.

Finally, in some embodiments, the account manager 18 may utilize mobility management state information to estimate the real time charges per session incurred during roaming and non-roaming scenarios.

15 While the present invention has been described with respect to a limited number of embodiments, those skilled in the art will appreciate numerous modifications and variations therefrom. It is intended that the appended claims cover all such modifications and variations as fall  
20 within the true spirit and scope of this present invention.

What is claimed is: